

FORM PTO-1390 (Modified) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE
(REV 10-95)

TRANSMITTAL LETTER TO THE UNITED STATES
DESIGNATED/ELECTED OFFICE (DO/EO/US)
CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER

1995

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR

10/069309

INTERNATIONAL APPLICATION NO.
PCT/DE 00/02669

INTERNATIONAL FILING DATE
AUGUST 10, 2000

PRIORITY DATE CLAIMED
AUGUST 13, 1999

TITLE OF INVENTION

METHOD FOR PRODUCING PIEZOELECTRIC ACTUATORS WITH A MULTILAYER STRUCTURE OF
PIEZOELECTRIC LAYERS

APPLICANT(S) FOR DO/EO/US

Ulrich EISELE

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
 - a. ☐ is transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☒ has been transmitted by the International Bureau.
 - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
 - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
 - b. ☐ have been transmitted by the International Bureau.
 - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
 - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☐ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

Items 13 to 18 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
A **SECOND** or **SUBSEQUENT** preliminary amendment.
16. ☐ A substitute specification.
17. ☐ A change of power of attorney and/or address letter.
18. ☒ Certificate of Mailing by Express Mail
19. ☐ Other items or information:

ET 755323852 US

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.101) <div style="font-size: 24pt; font-weight: bold; margin-top: 5px;">107069309</div>		INTERNATIONAL APPLICATION NO. PCT/DE 00/02669		ATTORNEY'S DOCKET NUMBER 1995	
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20. The following fees are submitted: BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) : <div style="margin-top: 5px;"> <input type="checkbox"/> Search Report has been prepared by the EPO or JPO \$930.00 <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) \$720.00 <input type="checkbox"/> No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2)) \$790.00 <input checked="" type="checkbox"/> Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1,070.00 <input type="checkbox"/> International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) \$98.00 </div> <div style="text-align: right; margin-top: 10px;"> ENTER APPROPRIATE BASIC FEE AMOUNT = </div>				CALCULATIONS PTO USE ONLY <div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$890.00 </div> </div>	
Surcharge of \$130.00 for furnishing the oath or declaration later than months from the earliest claimed priority date (37 CFR 1.492 (e)). <input type="checkbox"/> 20 <input type="checkbox"/> 30				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	8 - 20 =	0	x \$18.00	<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
Independent claims	1 - 3 =	0	x \$80.00	<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
Multiple Dependent Claims (check if applicable). <input type="checkbox"/>				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
TOTAL OF ABOVE CALCULATIONS =				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$890.00 </div> </div>	
Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable). <input type="checkbox"/>				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
SUBTOTAL =				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$890.00 </div> </div>	
Processing fee of \$130.00 for furnishing the English translation later than months from the earliest claimed priority date (37 CFR 1.492 (f)). <input type="checkbox"/> 20 <input type="checkbox"/> 30				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
TOTAL NATIONAL FEE =				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$890.00 </div> </div>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable). <input type="checkbox"/>				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$0.00 </div> </div>	
TOTAL FEES ENCLOSED =				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> \$890.00 </div> </div>	
				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> Amount to be: refunded \$ </div> </div>	
				<div style="border: 1px solid black; padding: 2px;"> <div style="display: flex; justify-content: space-between;"> charged \$ </div> </div>	

☐ A check in the amount of _____ to cover the above fees is enclosed.

☒ Please charge my Deposit Account No. **19-4675** in the amount of **\$890.00** to cover the above fees.
 A duplicate copy of this sheet is enclosed.

☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **19-4675**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

STRIKER, STRIKER & STENBY
103 EAST NECK ROAD
HUNTINGTON, NEW YORK 11743

MICHAEL J. STRIKER
 NAME

27233
 REGISTRATION NUMBER

FEBRUARY 11, 2002
 DATE

UNITED STATES PATENT AND TRADEMARK OFFICE

Examiner:

Group:

Attorney Docket # 1995

Applicant(s) : EISELE, U.

Serial No. :

Filed :

For : METHOD FOR PRODUCING PIEZOELECTRIC
ACTUATORS WITH A MULTILAYER STRUCTURE OF
PIEZOELECTRIC LAYERS

SIMULTANEOUS AMENDMENT

February 11, 2002

Honorable Commissioner of Patents and Trademarks
Washington, D.C. 20231

S I R S:

Simultaneously with filing of the above identified application
please amend the same as follows:

In the Claims:

Cancel all claims without prejudice.

Substitute the claims attached hereto.

REMARKS:

This Amendment is submitted simultaneously with filing of the above identified
application.

With the present Amendment applicant has amended the claims so as to eliminate
their multiple dependency.

10/069309

JC13 Rec'd PCT/PTO 11 FEB 2002

Consideration and allowance of the present application is most respectfully requested.

Respectfully submitted,



Michael J. Striker
Attorney for Applicant(s)
Reg. No. 27233

Claims

1. A method for producing a piezoelectric actuator (8)
5 with a multilayer structure of layers of a piezoelectric sheet
(3, 4), and with inner electrodes disposed between them,
characterized in that

- the individual layers are formed of two continuous
10 strands (3, 4) of the piezoelectric sheet, and the two strands
(3, 4) are wound over one another in the form of a double helix
to form a hollow-cylindrical stack, thereby enclosing the inner
electrode between them.

15 2. The method of claim 1, characterized in that

- the two strands (3, 5) are guided over deflection rollers
(5, 6, 7) in such a way that the overlays of the two strands (3,
4) on the already-wound stack are offset from one another by a
20 predetermined angular amount.

3. The method of claim 2, characterized in that

- the predetermined angular amount is approximately 150°.

25 4. The method of [one of the foregoing claims] claim 1,
characterized in that

- the two strands (3, 4), while being guided over the
30 deflection rollers (5, 6), are provided with an electrode paste
(12) by means of at least one further roller (13, 14).

5. The method of [one of the foregoing claims] claim 1,
characterized in that

- 5 - the two strands (3, 4), in the region of the overlay on
the already-wound stack, are each pressed against the stack with
a respective contact-pressure roller (9, 10).

6. The method of [one of the foregoing claims] claim 1,
characterized in that

10

- the strands (3, 4) have a trapezoidal cross section.

7. The method of [one of the foregoing claims] claim 1,
characterized in that

15

- the two strands (3, 4) are each extruded from a
piezoelectric compound by means of an extruder nozzle (2), then
wound around an empty tube (11), and after reaching a
predetermined length are cut off, and that

20

- in a thermal process, the stack is unbound, and the empty
tube (11) is removed by destruction or similar methods.

8. An apparatus for employing the method of [one of the
25 foregoing claims] claim 1, characterized in that

- an extruder nozzle (2) for forming the strands (3, 4),
three deflection rollers (5, 6, 7) for guiding the strands (3,
4), two contact-pressure rollers (9, 10) for applying the strands
30 (3, 4) to the stack, and

- at least one pressure roller (13, 14) for applying an

electrode paste (12), and an empty tube (11) for centering the hollow-cylindrical stack are present.

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Claims

1. A method for producing a piezoelectric actuator (8)
5 with a multilayer structure of layers of a piezoelectric sheet
(3, 4), and with inner electrodes disposed between them,
characterized in that

- the individual layers are formed of two continuous
10 strands (3, 4) of the piezoelectric sheet, and the two strands
(3, 4) are wound over one another in the form of a double helix
to form a hollow-cylindrical stack, thereby enclosing the inner
electrode between them.

15 2. The method of claim 1, characterized in that

- the two strands (3, 5) are guided over deflection rollers
(5, 6, 7) in such a way that the overlays of the two strands (3,
4) on the already-wound stack are offset from one another by a
20 predetermined angular amount.

3. The method of claim 2, characterized in that

- the predetermined angular amount is approximately 150°.

25 4. The method of claim 1, characterized in that

- the two strands (3, 4), while being guided over the
deflection rollers (5, 6), are provided with an electrode paste
30 (12) by means of at least one further roller (13, 14).

5. The method of claim 1, characterized in that

- the two strands (3, 4), in the region of the overlay on the already-wound stack, are each pressed against the stack with a respective contact-pressure roller (9, 10).

5 6. The method of claim 1, characterized in that

- the strands (3, 4) have a trapezoidal cross section.

10 7. The method of claim 1, characterized in that

- the two strands (3, 4) are each extruded from a piezoelectric compound by means of an extruder nozzle (2), then wound around an empty tube (11), and after reaching a predetermined length are cut off, and that

15

- in a thermal process, the stack is unbound, and the empty tube (11) is removed by destruction or similar methods.

20 8. An apparatus for employing the method of claim 1, characterized in that

- an extruder nozzle (2) for forming the strands (3, 4), three deflection rollers (5, 6, 7) for guiding the strands (3, 4), two contact-pressure rollers (9, 10) for applying the strands (3, 4) to the stack, and

25

- at least one pressure roller (13, 14) for applying an electrode paste (12), and an empty tube (11) for centering the hollow-cylindrical stack are present.

2/pyl

METHOD FOR PRODUCING PIEZOELECTRIC ACTUATORS WITH A
MULTILAYER STRUCTURE OF PIEZOELECTRIC LAYERS

Prior Art

5

The invention relates to a method for producing piezoelectric actuators with a multilayer structure of piezoelectric layers, for instance for a piezoelectric actuator for actuating a mechanical component such as a valve or the like, as generically defined by the characteristics of the preamble to the main claim, and to an apparatus for performing the method.

It is well known to produce piezoelectric actuators with piezoelectric elements to utilize the so-called piezoelectric effect, these piezoelectric actuators being constructed of a material with a suitable crystalline structure. The construction of this piezoelectric actuator is done here in a plurality of layers (multilayer piezoelectric actuators), and the electrodes by way of which the electrical voltage is applied are each disposed between the layers. These piezoelectric multilayer actuators are produced conventionally by sheet casting, printing of the electrodes, and lamination. The printing, intermediate drying and lamination are so-called batch processes in this case. The piezoelectric actuators have several hundred laminate layers, and the contacting is done by means of two electrodes mounted on the sides. The inner electrodes must end in alternation in the interior of the ak, because otherwise there would be a short circuit to the respective opposite pole. On these ends, mechanical stresses occur in operation, which can cause harmful cracks to develop, and the growth of these cracks during operation in the final analysis limits the service life of the piezoelectric actuator.

When an external electrical voltage is applied to the inner electrodes, a mechanical reaction of the piezoelectric element ensues, which as a function of the crystalline structure and the direction of the electrical voltage represents a pressure or tension in a predeterminable direction. Electrical charging of the piezoceramic stack causes these layers to expand or contract. The associated reciprocation of the piezoelectric stack can be used to switch a valve, for instance for controlling fuel metering in an internal combustion engine.

Advantages of the Invention

A method for producing a piezoelectric actuator with a multilayer structure of layers of a piezoelectric sheet and with inner electrodes disposed between them is advantageously further embodied in that the individual layers are formed of two continuous strands, for instance with a trapezoidal cross section, of the piezoelectric sheet, and the two strands are wound over one another in the form of a double helix to form a hollow-cylindrical stack, thereby enclosing the inner electrode between them.

With the invention, a double helix piezoelectric actuator can be formed in a simple way, in which because of the advantageous construction, the risk of failure from cracking as described at the outset is greatly reduced. Here, two dielectric electrode pairs insulated from one another are present in the form of a double helix. The piezoelectric actuator takes the form of a hollow cylinder, and the two inner electrodes have only one end on a face end of the piezoelectric actuator where the external contacting takes place. By means of the continuous production process, the batch processes mentioned above and the disadvantages in

the operation of the piezoelectric actuator produced in that way are avoided.

5 In a preferred embodiment, the two strands are guided over deflection rollers in such a way that the overlays of the two strands on the already-wound stack are offset from one another by a predetermined angular amount. Here the predetermined angular amount can be approximately 150°.

10 The inner electrodes can be placed between the coiled layers in a simple way, by providing that the two strands, while being guided over the deflection rollers, are provided with an electrode paste by means of one further roller. In addition, the two strands, in the region of the overlay on
15 the already-wound stack, can each be pressed against the stack with a respective contact-pressure roller.

In an advantageous embodiment of the method of the invention, the two strands are each extruded from a
20 piezoelectric compound by means of an extruder nozzle, then wound around an empty tube, and after reaching a predetermined length are cut off. The stack can then be sintered in a thermal process, in the course of which the empty tube is also removed. For many applications, such as
25 piezoelectrically performing a direct fuel injection, a piezoelectric actuator with a central bore is provided, which automatically occurs as a result of the structural form proposed here.

30 An advantageous apparatus for employing the above-described method has an extruder nozzle for forming the strands, three deflection rollers for guiding the strands, two contact-pressure rollers for applying the strands to the stack, at least one pressure roller for applying an electrode

paste, and an empty tube for centering the hollow-cylindrical stack.

5 These and other characteristics of preferred
refinements of the invention can be learned not only from the
claims but also from the description and the drawings; the
individual characteristics can each be realized on their own
or a plurality of them can be made into subcombinations in
the embodiment of the invention and used in other fields, and
10 can advantageously represent intrinsically patentable
embodiments for which patent protection is claimed here.

Drawing

15 One exemplary embodiment of an apparatus for employing
the method of the invention for producing a multilayer
piezoelectric actuator will be describe in conjunction with
the drawing. Shown are:

20 Fig. 1, a schematic view of the apparatus for
performing a double helix construction of piezoelectric
layers;

25 Fig. 2, a plan view on the arrangement of Fig. 1;

Fig. 3, a detail view of contact-pressure rollers as
the strands are coiled onto the stack; and

30 Fig. 4, a detail view of printing the electrode paste
onto the strands, for forming the inner electrodes.

Description of the Exemplary Embodiment

An apparatus 1 of Fig. 1 includes an extruder 2, with

which two parallel strands 3 and 4 of a special piezoelectric compound are extruded from appropriate nozzles. Both strands 3 and 4 have a trapezoidal cross section, in order to compensate for the greater deformation on the outside that occurs during winding. The strands 3 and 4 are guided parallel over a first deflection roller 5 and a second deflection roller 6. A third deflection roller 7 guides one of the strands 4, deflected in the opposite direction and back by about 30° , in such a way that the two strands 3 and 4 are then wound, offset by about 150° , onto the already-finished windings of the stack of the piezoelectric actuator 8.

Fig. 2 shows the apparatus 1 of Fig. 1 again in a plan view. Fig. 3 shows the forming of the stack of the piezoelectric actuator 8 in detail; here in particular one contact-pressure roller 9 for the strand 3 and another contact-pressure roller 10 can be seen clearly. The contact-pressure rollers 9 and 10 press the respective strands 3 and 4 against the lower winding and thus assure a good connection of the layers of the stack of the piezoelectric actuator 8. An empty tube 11 of plastic, which can be delivered from above, here assures good centering of the stack of the piezoelectric actuator 8.

Fig. 4 shows one possible way of applying an electrode paste 12 to the strands 3 and 4. Applying this paste is done here via rollers 13 and 14 onto one side of the strands 3 and 4, by rolling the paste 12 on during the production of the winding. During the production, this accordingly creates an infinitely long base body of the piezoelectric actuator 8, which can be cut to the size needed for the particular application. By a thermal treatment of the wound stack of the piezoelectric actuator 8, the process aids (binders,

etc.) are removed from the compound and the electrode paste is also removed, and the empty tube 11 is destroyed. After that, the base body of the piezoelectric actuator 8 is sintered.

Claims

1. A method for producing a piezoelectric actuator (8)
5 with a multilayer structure of layers of a piezoelectric
sheet (3, 4), and with inner electrodes disposed between
them, characterized in that

- the individual layers are formed of two continuous
10 strands (3, 4) of the piezoelectric sheet, and the two
strands (3, 4) are wound over one another in the form of a
double helix to form a hollow-cylindrical stack, thereby
enclosing the inner electrode between them.

15 2. The method of claim 1, characterized in that

- the two strands (3, 5) are guided over deflection
rollers (5, 6, 7) in such a way that the overlays of the two
strands (3, 4) on the already-wound stack are offset from one
20 another by a predetermined angular amount.

3. The method of claim 2, characterized in that

- the predetermined angular amount is approximately
25 150°.

4. The method of one of the foregoing claims,
characterized in that

30 - the two strands (3, 4), while being guided over the
deflection rollers (5, 6), are provided with an electrode
paste (12) by means of at least one further roller (13; 14).

5. The method of one of the foregoing claims,

characterized in that

5 - the two strands (3, 4), in the region of the overlay
on the already-wound stack, are each pressed against the
stack with a respective contact-pressure roller (9, 10).

6. The method of one of the foregoing claims,
characterized in that

10 - the strands (3, 4) have a trapezoidal cross section.

7. The method of one of the foregoing claims,
characterized in that

15 - the two strands (3, 4) are each extruded from a
piezoelectric compound by means of an extruder nozzle (2),
then wound around an empty tube (11), and after reaching a
predetermined length are cut off, and that

20 - in a thermal process, the stack is unbound, and the
empty tube (11) is removed by destruction or similar methods.

8. An apparatus for employing the method of one of the
foregoing claims, characterized in that

25 - an extruder nozzle (2) for forming the strands (3,
4), three deflection rollers (5, 6, 7) for guiding the
strands (3, 4), two contact-pressure rollers (9, 10) for
applying the strands (3, 4) to the stack, and

30 - at least one pressure roller (13, 14) for applying an
electrode paste (12), and an empty tube (11) for centering
the hollow-cylindrical stack are present.

Abstract

5 A method for producing a piezoelectric actuator (8)
with a multilayer structure of layers of a piezoelectric
sheet (3, 4), and with inner electrodes disposed between
them, is proposed, in which the individual layers are formed
of two continuous strands (3, 4) of the piezoelectric sheet,
and the two strands (3, 4) are wound over one another in the
10 form of a double helix to form a hollow-cylindrical stack,
thereby enclosing the inner electrode between them. The two
strands (3, 5) are preferably guided over deflection rollers
(5, 6, 7) in such a way that the overlays of the two strands
(3, 4) on the already-wound stack are offset from one another
15 by a predetermined angular amount.

(Fig. 1)

1/2

FIG. 1

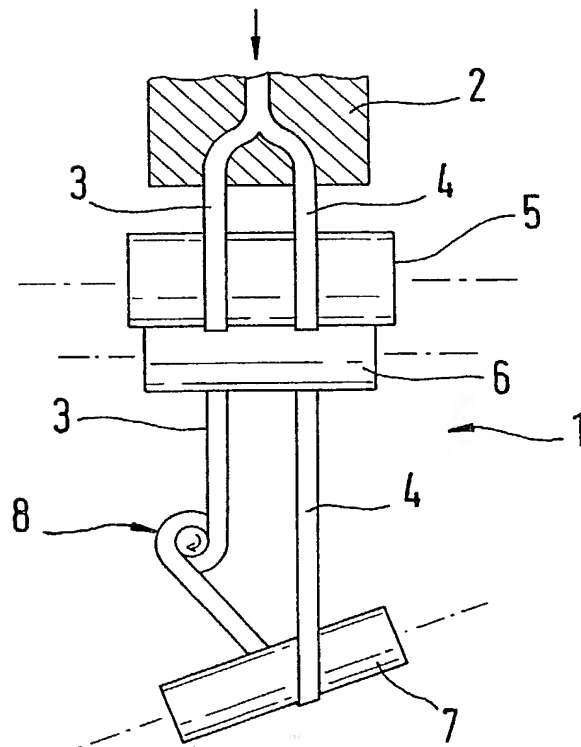
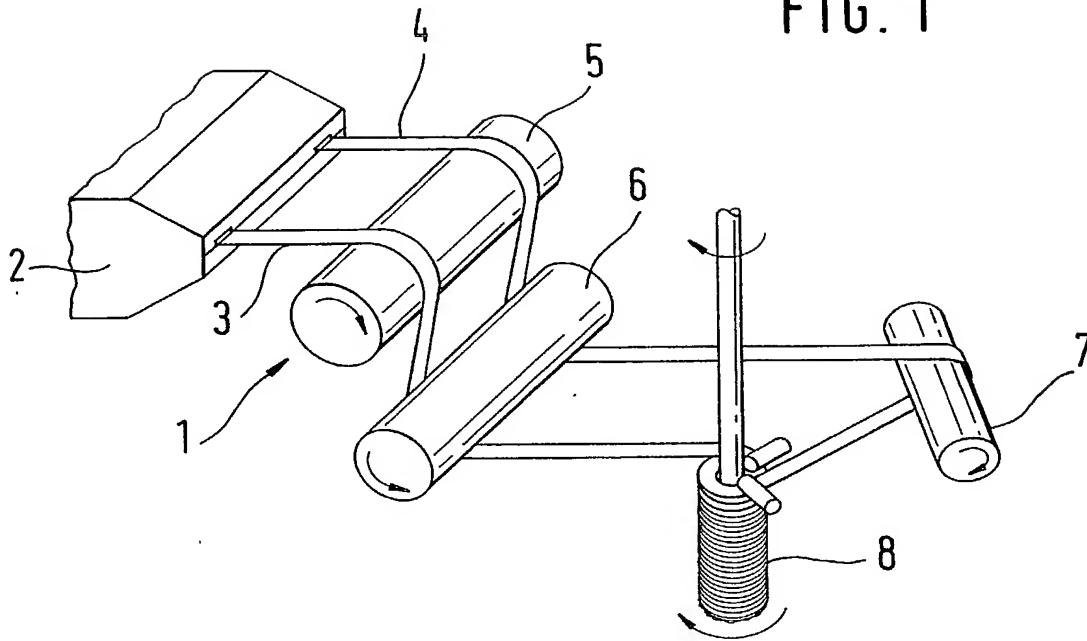


FIG. 2

2 / 2

FIG. 3

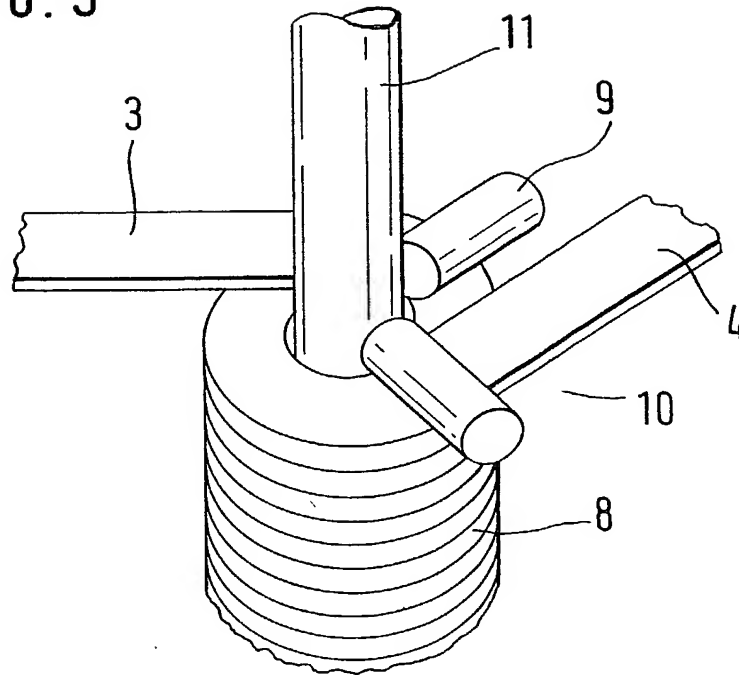
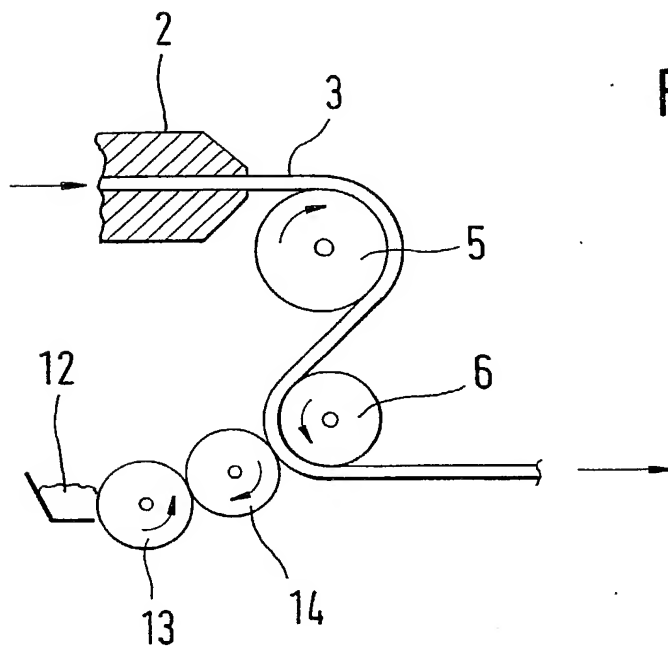


FIG. 4



DECLARATION AND POWER OF ATTORNEY FOR NATIONAL STAGE OF PCT PATENT APPLICATION

As a below-named inventor, I hereby declare that:

Ulrich EISELE

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **METHOD FOR PRODUCING PIEZOELECTRIC ACTUATORS WITH A MULTILAYER STRUCTURE OR PIEZOELECTRIC LAYERS** the specification of which was filed as PCT International Application number PCT/DE 00/02669 on August 10, 2000.

I hereby state that I believe the named inventor or inventors in this Declaration to be the original and first inventor or inventors of the subject matter which is claimed and for which a patent is sought.

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose all information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365 (b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior foreign application(s):

Priority claimed:

<u>199 38 456.8</u>	<u>GERMANY</u>	<u>AUGUST 13, 1999</u>	<u>X</u>	
(Number)	(Country)	(Date filed)	Yes	No
<u> </u>	<u> </u>	<u> </u>	Yes	No
(Number)	(Country)	(Date filed)		

As a named inventor, I hereby appoint the following attorney to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

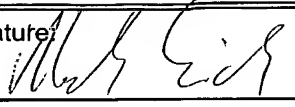
Michael J. Striker, Reg. No. 27233

Direct all telephone calls to Striker, Striker & Stenby at telephone no.: (631) 549 4700 and address and all correspondence to:

STRIKER, STRIKER & STENBY
103 East Neck Road
Huntington, New York 11743
U.S.A.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that wilful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such wilful false statement may jeopardize the validity of the application or any patent issued thereon.

1-00

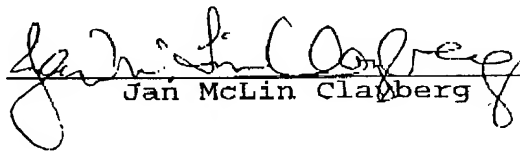
Signature: 	Date: 28.7.2002	Residence and Full Postal Address: Boecklerstrasse 6B 70199 Stuttgart Germany DEX
Full Name of First or Sole Inventor: Ulrich EISELE	Citizenship: GERMAN	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Second Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Third Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fourth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Fifth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Sixth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Seventh Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Eighth Inventor:	Citizenship:	
Signature:	Date:	Residence and Full Postal Address:
Full Name of Ninth Inventor:	Citizenship:	

January 23, 2002

DECLARATION

The undersigned, Jan McLin Clayberg, having an office at 5316 Little Falls Road, Arlington, VA 22207-1522, hereby states that she is well acquainted with both the English and German languages and that the attached is a true translation to the best of her knowledge and ability of international patent application PCT/DE 00/02669 of EISELE, U., entitled "METHOD FOR PRODUCING PIEZOELECTRIC ACTUATORS WITH A MULTILAYER STRUCTURE OF PIEZOELECTRIC LAYERS".

The undersigned further declares that the above statement is true; and further, that this statement was made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or document or any patent resulting therefrom.


Jan McLin Clayberg